

Los Angeles / Long Beach Workshop Report

Introduction

A one-day Port Risk Assessment Workshop was conducted for Los Angeles / Long Beach, California on March 22, 2001. This workshop report provides the following information:

- Brief description of the process used for the assessment;
- List of participants;
- Numerical results from the Analytic Hierarchy Process (AHP)¹;
- Summary of risks and mitigations discussion; and
- Los Angeles / Long Beach Port Attributes Summaries.

Strategies for reducing unmitigated risks will be the subject of a separate report.

Assessment Process

The risk assessment process is a structured approach to obtaining expert judgments on the level of waterway risk. The process also addresses the relative merits of specific types of Vessel Traffic Management (VTM) improvements for reducing risk in the port. Based on the Analytic Hierarchy Process (AHP), the port risk assessment process uses a select group of waterway users/stakeholders in each port to evaluate waterway risk factors and the effectiveness of various VTM improvements. The process requires the participation of local Coast Guard officials before and throughout the workshops. Thus the process is a joint effort involving waterway experts and the agencies/entities responsible for implementing selected risk mitigation measures.

This methodology employs a generic model of port risk that was conceptually developed by a National Dialog Group on Port Risk and then translated into computer algorithms by the Volpe National Transportation Systems Center. In that model, risk is defined as the sum of the probability of a casualty and its consequences. Consequently, the model includes variables associated with both the causes and the effects of vessel casualties. Because the risk factors in the model do NOT contribute equally to overall port risk, the first session of each workshop is normally devoted to obtaining expert opinion about how to weight the relative contribution of each variable to overall port risk. This step in the process is eliminated when the workshop is compressed into one day, as was done for Los Angeles / Long Beach. The experts then are asked to establish scales to measure each variable. Once the parameters have been established for each risk-inducing factor, port specific risk is estimated by putting into the computer risk model specific values for that port for each variable. The computer model allows comparison of relative risk and the potential efficacy of various VTM improvements between different ports.

– ¹ Developed by Dr. Thomas L. Saaty, et al, to structure complex decision making, to provide scaled measurements, and to synthesize many factors having different dimensions.

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Participants

The following is a list of waterway users and stakeholders who participated in the process:

Participant	Organization	Phone	Email
M.H.K. Aschmeyer	Marine Exchange of LA/LB Harbor	(310) 519-3127	mhka@marexlab.org
Robert Barker	Port of Long Beach	(562) 590-4178	barker@pola.com
Torben Blichfeld	Maersk Pacific Ltd.	(562) 901-3511	Wercortp5@maersk.com
Mark Boone	Los Angeles Fire Department	(562) 570-1288	maboone@clb.com
Edward Boyes	CA Dept. of Fish & Game; OSPR	(562) 598-4302	eboyes@ospr.dfg.gov
Bruce Burton	Naval Weapons Station Seal Beach	(562) 626-7206	burton.bruce@sbeach.navy.mil
Mohanned Chang	USACE Los Angeles District	(213) 452-3405	mchang@spl.usace.army.mil
Reid Crispino	Marine Exchange / VTS LA-LB	(310) 832-6411	rjc@marexlab.org
Lindsay Dew	USCG MSO/GRU LA-LB	(310) 732-2013	ldew@d11.uscg.mil
Steve Fleischli	Santa Monica Bay Keeper	(310) 305-9645	sfleischli@smbaykeeper.org
Bill Fletcher	Port of Los Angeles Port Police	(310) 732-3521	bfletcher@portla.org
Michelle Garcia	CDF&G / OSPR	(916) 324-9782	mmgarcia@ospr.dfg.ca.gov
Tom Harrison	USCG MSO/GRU LA-LB	(310) 732-7383	tharrison@d11.uscg.mil
Carl Hohl	USCG Station LA-LB	(310) 732-7301	chohl@d11.uscg.mil
Roy Kozaki	Los Angeles Fire Department	(310) 548-7516	jala4@earthlink.net
Doug Larsen	Public Service Marine, Inc.	(562) 983-9034	dlarsen@harleymarine.com
Ray Lyman	Catalina Channel Express	(310) 519-7971	rlyman@catalinaexpress.com
Tim Manning	Los Angeles Fire Department	(213) 485-6290	ta5966@aol.com
Fran McClain	USCG MSO/GRU LA-LB	N/A	fmccclain@d11.uscg.mil
Dick McKenna	Marine Exchange / VTS LA-LB	(310) 519-3126	rbm@marexlab.com
Jeff Neumann	USCGC George Cobb	(310) 732-7230	jneumann@d11cutters.uscg.mil
Harvey Portz	Chevron Shipping Company	(310) 241-1385	hmpo@chevron.com
Mike Rubino	Port of LA Harbor Services	(310) 732-3805	rubinom@portla.org
John Strong	Jacobsen Pilot Service	(562) 435-5435	jzs@jacobsenpilot.com

Facilitation Team	Organization	Phone	Email
LCDR Dave Murk	USCG Commandant (G-MWV)	(202) 267-0352	dmurk@comdt.uscg.mil
Doug Perkins	Potomac Management Group, Inc.	(703) 836-1037	dperkins@potomacmgmt.com
Paul Barger	Potomac Management Group, Inc.	(703) 836-1037	pbarger@potomacmgmt.com
Leanne Rebuck	Potomac Management Group, Inc.	(703) 836-1037	lrebuck@potomacmgmt.com

Numerical Results

Book 3 Factor Scales - Condition List (*Generic*)

Scale Value

Wind Conditions

- | | |
|--|-----|
| a. Severe winds < 2 days / month | 1.0 |
| b. Severe winds occur in brief periods | 2.3 |
| c. Severe winds are frequent & anticipated | 5.2 |
| d. Severe winds occur without warning | 9.0 |

Visibility Conditions

- | | |
|--|-----|
| a. Poor visibility < 2 days/month | 1.0 |
| b. Poor visibility occurs in brief periods | 2.4 |
| c. Poor visibility is frequent & anticipated | 5.2 |
| d. Poor visibility occurs without warning | 9.0 |

Tide and River Currents

- | | |
|---|-----|
| a. Tides & currents are negligible | 1.0 |
| b. Currents run parallel to the channel | 2.0 |
| c. Transits are timed closely with tide | 4.7 |
| d. Currents cross channel/turns difficult | 9.0 |

Ice Conditions

- | | |
|---------------------------------------|-----|
| a. Ice never forms | 1.0 |
| b. Some ice forms-icebreaking is rare | 1.8 |
| c. Icebreakers keep channel open | 4.8 |
| d. Vessels need icebreaker escorts | 9.0 |

Visibility Obstructions

- | | |
|---|-----|
| a. No blind turns or intersections | 1.0 |
| b. Good geographic visibility-intersections | 2.3 |
| c. Visibility obscured, good communications | 5.0 |
| d. Distances & communications limited | 9.0 |

Channel Width

- | | |
|---|-----|
| a. Meetings & overtakings are easy | 1.0 |
| b. Passing arrangements needed-ample room | 2.5 |
| c. Meetings & overtakings in specific areas | 6.1 |
| d. Movements restricted to one-way traffic | 9.0 |

Bottom Type

- | | |
|--|-----|
| a. Deep water or no channel necessary | 1.0 |
| b. Soft bottom, no obstructions | 2.1 |
| c. Mud, sand and rock outside channel | 5.0 |
| d. Hard or rocky bottom at channel edges | 9.0 |

Waterway Complexity

- | | |
|--|-----|
| a. Straight run with NO crossing traffic | 1.0 |
| b. Multiple turns > 15 degrees-NO crossing | 2.6 |
| c. Converging - NO crossing traffic | 5.0 |
| d. Converging WITH crossing traffic | 9.0 |

Number of People on Waterway

- | | |
|--|-----|
| a. Industrial, little recreational boating | 1.0 |
|--|-----|

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b. Recreational boating and fishing	3.5
c. Cruise & excursion vessels-ferries	6.1
d. Extensive network of ferries, excursions	9.0

Petroleum Volume

a. Little or no petroleum cargoes	1.0
b. Petroleum for local heating & use	2.7
c. Petroleum for transshipment inland	5.5
d. High volume petroleum & LNG/LPG	9.0

Chemical Volume

a. Little or no hazardous chemicals	1.0
b. Some hazardous chemical cargo	2.6
c. Hazardous chemicals arrive daily	5.7
d. High volume of hazardous chemicals	9.0

Economic Impacts

a. Vulnerable population is small	1.0
b. Vulnerable population is large	3.5
c. Vulnerable, dependent & small	5.5
d. Vulnerable, dependent & large	9.0

Environmental Impacts

a. Minimal environmental sensitivity	1.0
b. Sensitive, wetlands, VULNERABLE	3.2
c. Sensitive, wetlands, ENDANGERED	6.1
d. ENDANGERED species, fisheries	9.0

Health and Safety Impacts

a. Small population around port	1.0
b. Medium - large population around port	2.9
c. Large population, bridges	5.9
d. Large DEPENDENT population	9.0

Analysis:

The purpose of Book 3 is for the participants to calibrate a risk assessment scale for each risk factor. For each risk factor there is a low (Port Heaven) and a high (Port Hell) severity limit, which are assigned values of 1.0 and 9.0 respectively. The participants determined numerical values for two intermediate qualitative descriptions between those two extreme limits. On average, participants from this port evaluated the difference in risk between the lower limit (Port Heaven) and the first intermediate scale point as being 1.6; the difference in risk between the first and second intermediate scale points was 2.8; and the difference in risk between the second intermediate scale point and the upper risk limit (Port Hell) was 3.6.

Book 4 - Risk Factor Ratings (*Los Angeles / Long Beach*)

Fleet Composition	Traffic Conditions	Navigational Conditions	Waterway Configuration	Immediate Consequences	Subsequent Consequences
% High Risk Deep Draft 6.5	Volume Deep Draft 7.0	Wind Conditions 2.8	Visibility Obstructions 3.6	# of People on Waterway 6.9	Economic Impacts 8.1
% High Risk Shallow Draft 5.5	Volume Shallow Draft 6.5	Visibility Conditions 3.6	Channel Width 3.6	Volume of Petroleum 8.7	Environmental Impacts 6.6
	Vol. Fishing & Pleasure Craft 7.3	Tide & River Currents 1.7	Bottom Type 4.6	Volume of Chemicals 6.8	Health & Safety Impacts 6.2
	Traffic Density 6.8	Ice Conditions 1.0	Waterway Complexity 7.9		

Analysis:

This is the point in the workshop when the process begins to address local port risks. The participants use the scales developed in Book 3 to assess the absolute level of risk in their port for each of the 20 risk factors. The values shown in the preceding table do NOT add up to 100. Based on the input from the participants, the following are the top risks to port safety in Los Angeles / Long Beach (in declining order of importance):

1. Volume of Petroleum (8.7)
2. Economic Impacts (8.1)
3. Waterway Complexity (7.9)
4. Volume of Fishing & Pleasure Craft (7.3)
5. Volume of Deep Draft (7.0)
6. Number of People on Waterway (6.9)
7. Volume of Chemicals (6.8) (tie)
8. Traffic Density (6.8) (tie)
9. Environmental Impacts (6.6)
10. % High Risk Deep Draft (6.5) (tie)
11. Volume of Shallow Draft (6.5) (tie)

Book 5 - VTM Tools (Los Angeles / Long Beach)

Fleet Composition	Traffic Conditions	Navigation Conditions	Waterway Configuration	Immediate Consequences	Subsequent Consequences
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% High Risk Deep Draft		Volume Deep Draft		Wind Conditions		Visibility Obstructions		# of People on Waterway		Economic Impacts	
7	1.5	11	1.1	19	-0.2	15	0.4	4	1.8	6	1.5
RA	ALERT	RA		RA		RA	ALERT	OTH	ALERT	RA	ALERT
% High Risk Shallow Draft		Volume Shallow Draft		Visibility Conditions		Channel Width		Volume of Petroleum		Environmental Impacts	
5	1.6	13	0.5	17	0.3	15	0.4	1	2.0	12	0.9
RR	ALERT	RA		RA		RA		RR	ALERT	RA	
		Vol. Fishing & Pleasure Craft		Tide & River Currents		Bottom Type		Volume of Chemicals		Health & Safety Impacts	
		2	2.0	20	-0.3	14	0.4	8	1.4	10	1.2
		RR		RA		RA		RR	ALERT	RA	ALERT
		Traffic Density		Ice Conditions		Waterway Complexity					
		9	1.3	18	-0.2	3	1.9				
		RA	ALERT	RA		RA	ALERT				

KEY	
Risk Factor	
Rank	Risk Gap
Tool	ALERT

RA Risk Acceptable

AN Improve Aids to Navigation

CM Improve Communications

RR Improve Rules & Regulations

SI Improve Static Navigation Info

DI Improve Dynamic Navigation Info

VTIS Vessel Traffic Information System

VTS Vessel Traffic System

OTH Other – not a VTM solution

Legend:

Rank is the position of the Risk Gap for a particular factor relative to the Risk Gap for the other factors as determined by the participants. Risk Gap is the variance between the existing level of risk for each factor determined in Book 4 and the average acceptable risk level as determined by each participant team. Negative numbers imply that the risk level could INCREASE and still be acceptable. The teams were instructed as follows: *If the acceptable risk level is equal to or higher than the existing risk level for a particular factor, circle RA (Risk Acceptable). If*

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the mitigation recommended does not fall under one of the VTM tools, circle OTH (Other) at the end of the line. Otherwise, circle the VTM tool that you feel would MOST APPROPRIATELY reduce the unmitigated risk to an acceptable level.

The tool listed is the one determined by the majority of participant teams as the best to narrow the Risk Gap. An **ALERT** is given if no mathematical consensus (greater than half of the total number of teams) is reached for the tool suggested.

Analysis:

The results shown are consistent with the discussion that occurred about risk in Los Angeles / Long Beach. For 9 of the 10 risk factors for which there was good consensus, the participants judged the risk to be at an acceptable level due to existing mitigation strategies. The participants suggested that VTM tools were appropriate for:

- Volume of Fishing and Pleasure Craft – RA (2), CM (1), RR (8), OTH (1)

A consensus alert occurred over the most appropriate VTM tool, as indicated:

- % High Risk Shallow Draft Vessels – RA (2), CM (1), RR (6), DI (1), VTIS (1), OTH (1)
- % High Risk Deep Draft – RA (4), RR (2), DI (4), VTIS (2)
- Traffic Density – RA (4), CM (1), RR (3), VTS (2), OTH (2)
- Visibility Obstructions – RA (6), AN (4), CM (1), DI (1)
- Waterway Complexity – RA (4), AN (2), CM (1), RR (2), DI (2), OTH (1)
- Number of People on Waterway – RA (3), RR (3), DI (1), OTH (5)
- Volume of Petroleum – RA (4), RR (5), DI (2), OTH (1)
- Volume of Chemicals – RA (4), RR (6), DI (1), OTH (1)
- Economic Impacts – RA (5), RR (4), DI (1), VTS (1), OTH (1)
- Health & Safety Impacts – RA (6), RR (2), VTS (1), OTH (3)

Summary of Risks

Scope of the port area under consideration: The participants defined the geographic bounds of the port area to be discussed as:

- The ports of Long Beach and Los Angeles outward to the 25-mile limit of the Vessel Traffic System operating area.

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Fleet Composition		
Percent High Risk Deep Draft Cargo & Passenger Vessels	<p>Today:</p> <ul style="list-style-type: none"> • Foreign ships: crews' proficiency is an issue, including language. • 65% of the VTS's classified incidents are caused by a mechanical casualty. • There are over 5,900 deep draft arrivals in the port annually, of which less than 1% are high-risk vessels. • Discovering an increasing rate of falsified mariners' documents. Labor is coming from foreign labor pools without good controls. • STCW requirements are discouraging experienced (older) crew from renewing licenses. • Reduced manning of ships nearly eliminates any self-response to emergencies. <p>Trends:</p> <ul style="list-style-type: none"> • Getting harder to find qualified crew, leading to less safe operation of vessels. • Vessels are getting larger and are minimally manned. • Seeing better quality vessels overall. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • The VTS operated by the Marine Exchange and Coast Guard, and the pilots' VTIS oversight and management within the harbor. • Port State Control measures whose goals are improved quality of ships and their crews, and in keeping poor quality ships from entering the port. • State's non-tank vessels regulations. • Mandatory pilotage. • Pilots' familiarity with the quality of ships that frequently enter the port lead them to evaluate the level of care needed to mitigate known risks associated with specific vessels. • Vessel Response Plans provide information necessary for response teams. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Fleet Composition (continued)		
<p>Percent High Risk Shallow Draft Cargo & Passenger Vessels</p>	<p>Today:</p> <ul style="list-style-type: none"> • These vessels are not as controlled as are deep draft vessels in the VTS system. • About 300 fishing vessels operate in the port. <ul style="list-style-type: none"> – F/V activities often interfere with traffic in the separation lanes. – F/V are not inspected and seem to be of questionable quality – Seasonal activity. Urchin divers are coming into the port area. • Recreational boaters not licensed • ~70% boaters may not have requisite nautical knowledge. • T-Boat operators carrying school groups. <p>Trends:</p> <ul style="list-style-type: none"> • Expecting a reduction of F/V due to decreasing fish stocks. The increasing cost of fuel marginalizes maintenance leading to higher risk. • Number of recreation boaters is growing. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • VTS advises controlled shipping of problem areas. • Local knowledge used by the professional mariners. • HSC seeks to improve public education by reaching segments of the population. <ul style="list-style-type: none"> – Active CGAUX and Power Squadron education programs. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Traffic Conditions		
Volume of Deep Draft Vessels	<p>Today:</p> <ul style="list-style-type: none"> • Precautionary area has mix of all types of vessels. • Peak vessel movements are early morning and at end of the normal workday. • Average 35-40 ships in port daily; highest was about 55 ships. • Main channel is deeper than any anchorage available. Ships must commit to their transit without option of alternate route. New dredging plans will increase this risk. <p>Trends:</p> <ul style="list-style-type: none"> • Trending upward 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Reconfiguration of the TTS and precautionary area has helped reduce risk. • VTS and VTIS oversight and management of the waterway • Mandatory pilotage • Precision navigation equipment. • Required tug escorts (escorted out to sea buoys in LB, 2-3 miles in LA for tankers/chemical and discrepant vessels) • Port today has capacity for more ship movements, with expansion coming. • VTS and pilots coordinate vessel timing of arrival to the pilot boarding area; sequencing of vessels' transit to berth by pilots. • Some companies are scheduling ship arrivals to avoid peak hours. <p>New ideas:</p> <ul style="list-style-type: none"> • Evaluating the stevedore fee structure and work rules to dissipate the motivation to have ships arriving during a compressed timeframe.
Traffic Conditions (continued)		
Volume of Shallow Draft Vessels	<p>Today:</p> <ul style="list-style-type: none"> • About 200 local shallow draft vessels routinely work in the port. • About 600 ferry transits per month to Catalina Is. <p>Trends:</p> <ul style="list-style-type: none"> • More movie shoots • Constant to slightly increasing trend. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • VTS/VTIS oversight and management of vessels; notifies vessels required to participate of problem areas. • Generally professional mariners. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Traffic Conditions (continued)		
Volume of Fishing & Pleasure Craft	<p>Today:</p> <ul style="list-style-type: none"> • Seasonal activity. • 250,000 registered within a 100 mile radius of the port. • Sea urchin divers working at Horseshoe Kelp from October through March. • Squid fleet shifting over to a sardine fishery. • VHF-FM radio congestion is high. • Recreation boaters sitting in the gates and off the Naval Weapons Station Seal Beach. • Regattas force traffic rerouting. • USS Coronado and Sea Shadow port visits will require safety/security zones. <p>Trends:</p> <ul style="list-style-type: none"> • More marine events. • More pleasure craft. • F/V numbers are static and depend upon the economy. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Coordination and scheduling with pilots during regattas/marine events reduces traffic conflicts. • COTP notices and marine event permitting process help industry plan port activities and other agencies provide adequate control. • Harbor Safety Committee has been active with outreach efforts (e.g., radio use info card and harbor safety guide pamphlet distributed) • Ferry routes and information on the VTS has been added to nautical charts. • Port outreach to public has been a strong effort. <p>New ideas:</p> <ul style="list-style-type: none"> • Renewed participation from the F/V community in the HSC. • Recreation-boater directed web sites. • Increase law enforcement presence by coordinating activity among the several agencies.

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Traffic Conditions (continued)		
Traffic Density	<p>Today:</p> <ul style="list-style-type: none"> • Very high recreation boater use on weekends. • Focused at breakwater gates which causes conflicts with deep and shallow draft vessels. • Cruise ship and ferry transits haven't been a problem. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • The Marine Exchange/CG VTS and pilots' VTIS overseeing and providing information to mariners. • Changed aids to navigation, and reconfigured approach lanes (September 2000) • RNA for precautionary area. • High presence of government agencies at marine events for safety and law enforcement. • Largest marinas are located at the outer edges of the port, away from commercial channels. • Jet skis restricted from the channel inside of Reservation Point; enforced by police and Coast Guard. • LHG ships escorted. • Pilots can call for enforcement to clear traffic at the gates in low visibility. <p>New ideas:</p> <ul style="list-style-type: none"> • Looking at AIS to help with this risk factor (tugs, ferries, sport fishermen, etc.) Too-wide spread use could be detrimental by overloading the display. • Long Beach enhances waterborne law enforcement presence. • Conduct area-wide evaluation of future waterborne asset requirements.

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Navigation Conditions		
Wind Conditions	<p>Today:</p> <ul style="list-style-type: none"> • 20% of the time the wind is strong enough • Maneuvering becomes more difficult in the port when winds at over 20 knots. • Deep draft vessels have trouble maneuvering in high winds in the East and West Basin channels and the Back Channel Long Beach. • Winds outside the harbor tend to affect the small boaters safety more than larger ships. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Winds predictably freshen in the afternoon from the same direction. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.
Navigation Conditions (continued)		
Visibility Conditions	<p>Today:</p> <ul style="list-style-type: none"> • 105 days of fog annually. • Sand blowing off Pier 400 also affects visibility in a very local area. <p>Trends:</p> <ul style="list-style-type: none"> • The amount of fog seems to be increasing. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Electronic navigation tools. • VTS/VTIS. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Navigation Conditions (continued)		
Tide & River Currents	<p>Today:</p> <ul style="list-style-type: none"> • There is a cross-channel current in Long Beach between the sea buoy and entrance that becomes more hazardous as ships get larger. • 4-6 foot tidal range in the ports. • Debris flushed out of rivers following periods of rain may become a hazard to small craft operations. • Current creates risk at Queensway Bay and Consolidated Slip. • Anaheim Bay has tidal-driven current that can be hazardous. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Accurate NOAA tide and current tables. • P.O.R.T.S is coming soon. • Local knowledge and professionalism of commercial mariners. • Sophisticated current meter with real-time measurements installed by Port of LB. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.
Navigation Conditions (continued)		
Ice Conditions	<p>Today:</p> <ul style="list-style-type: none"> • None in this area. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Never occurs. <p>New ideas:</p> <ul style="list-style-type: none"> • None.

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Waterway Configuration		
Visibility Obstructions	<p>Today:</p> <ul style="list-style-type: none"> Background lighting from the terminals obstruct ATON in the vicinity of Long Beach Pier J. Background lights hides ships and entrance navigation lights from approaching shipping. Reservation Point structures obstruct the line-of-sight visibility of oncoming traffic for all but the largest ships with high pilothouses. Small boats can't see traffic around the SE corner of the Navy Mole. <p>Trends:</p> <ul style="list-style-type: none"> With Pier 300 & 400 development underway, background may lighting render most channel markers and lighted buoys indistinguishable. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> Electronic navigation tools. VTIS. <p>New ideas:</p> <ul style="list-style-type: none"> None discussed.
Waterway Configuration (continued)		
Channel Width	<p>Today:</p> <ul style="list-style-type: none"> Major port chokepoints are: <ul style="list-style-type: none"> Both Angels and Queens Gates in the breakwaters The Heim and Badger Avenue bridges over Cerritos Channel. A ship outbound at Long Beach Channel loosing steerage would hazard anchorages C14 & C15. Back Channel in Long Beach is very narrow. Once past buoys #1 & 2 in Seal Beach, ships are committed without alternative. <p>Trends:</p> <ul style="list-style-type: none"> None discussed 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> Tug escorts are required according to the type of vessel, or the risk assessment associated with a specific ship of another class. <p>New ideas:</p> <ul style="list-style-type: none"> Additional tug escorts and one-way traffic requirements may be required according to the type of vessel or risk assessment.

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Waterway Configuration (continued)		
Bottom Type	<p>Today:</p> <ul style="list-style-type: none"> • The shallow water habitat is ringed with rock that is a hazard should a ship hit it. This used to be relatively deep water of no hazard to navigation. • Contaminated spoil materials at Consolidated Slip & the Los Angeles River mouth increase difficulty of dredging of shoals. • Groundings are resulting from shoaling extending farther from the Los Angeles River mouth. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • None discussed. <p>New ideas:</p> <ul style="list-style-type: none"> • None.

FACTOR	RISKS	RISK MITIGATION STRATEGIES
Waterway Configuration (continued)		
Waterway Complexity	<p>Today:</p> <ul style="list-style-type: none"> • There is a great deal of crossing traffic of every type vessel within the Precautionary Area. • Several meeting intersections and turning basins within the harbors' waterways. • Construction is constantly changing the configuration of the port. <p>Trends:</p> <ul style="list-style-type: none"> • None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • VTS controls the Precautionary Area. • Pilots' VTISs oversee and manage the waterway within the harbors. • Standards of Care guidelines. • Harbor speed restrictions established. • HSC sub-committees continuously evaluate navigation safety issues. • ATON and COLREGS provide navigation information and common rules for vessel operation. • Bridge team management tools, STCW improving ship navigation. • Mandatory pilotage. • Tugs of all capabilities are available. • After-event incident review and education of mariners. • Local knowledge of area. • Night-vision equipment for fast ships; helps eliminate background lighting problem too. • Real Time Oceanographic/meteorologic sensors and TV imaging of portions of the port. <p>New ideas:</p> <ul style="list-style-type: none"> • Use AIS to reduce radio communications while increasing information. • Upgrading VTS equipment with more sophisticated radar. Additional P.O.R.T.S. sensors and closed circuit harbor TV coming soon. • Improved VTS training standards.

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Immediate Consequences		
Number of People on Waterway	<p>Today:</p> <ul style="list-style-type: none"> • 8% of arrivals are passenger ships. • 1 million cruise-ship passengers per year. • About 2,000 passengers per ship. • Cruise ships moor at Berth 93. • Ferry traffic carries over 1 million passengers per year from passenger berth 95 and the Queen Mary moorings. <p>Trends:</p> <ul style="list-style-type: none"> • Slightly up. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Coast Guard, local agencies, and passenger industry addressing mass rescue problem. April 24th mass casualty drill using a 149-passenger scenario. • Cruise ships do not embark/disembark passengers while an LHG is transiting. • Ferries might be the best mass-rescue resource. <p>New ideas:</p> <ul style="list-style-type: none"> • Coordinating resources would be a major task during a mass rescue. • Might use the Vessel Mutual Assistance Plan from San Francisco as an exemplar for use in LA/LB.

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Immediate Consequences (continued)		
Volume of Petroleum Cargoes	<p>Today:</p> <ul style="list-style-type: none"> • Deep draft VLCC ships berth at pier 121. • Spot market forces results in varying amounts of tanker traffic into the port. • 15% of traffic is petroleum related. • Submerged pipelines carrying product from the oil islands and offshore rigs through anchorage area E predominantly, and elsewhere throughout the port. <p>Trends:</p> <ul style="list-style-type: none"> • Tank ships are getting larger. • Shipments tending slightly upward. • Traffic at El Segundo is down 35% even though more product is being delivered. • Offshore ULCC lightering increasing in frequency and closer to shoreline. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Harbor Safety Plan. <ul style="list-style-type: none"> – Standards of Care Practices. – Tankship Escort regulations. • VTS and pilot-controlled movements. • Exercises of regional response plans. • Pre-staged equipment is the best in California. • Tank & state-required non-tank vessel pollution contingency plans. • Required booming for bunkering operations. • Mostly double-hulled barges. OPA 90 drives change. Single-hulled barges must have a tug escort. • Unannounced exercises. <p>New ideas:</p> <ul style="list-style-type: none"> • Refine plans for dispersant use. • More multi-agency training and exercises.

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Immediate Consequences (continued)		
Volume of Hazardous Chemical Cargoes	<p>Today:</p> <ul style="list-style-type: none"> • The ports handle LNG, LPG, any petroleum distillates, caustic soda, jet fuel; essentially all types of chemicals. • Can't be sure of action required in response to a chemical release event until the type of chemical is absolutely known. • Swirling winds affect evacuation plans in case of toxic plumes. • SEA LAUNCH operations involve rocket fuel and liquefied oxygen. • The Port handles explosive cargos. An explosives anchorage is designated inside the breakwall (anchorage K-1) <p>Trends:</p> <ul style="list-style-type: none"> • Slightly up. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • Good first-responder capability exists; however, there are conflicts between life-safety and economically driven operations. Good command and response system. • Computer plume projections. • County organizations are exceptionally well prepared. • Area contingency plan addresses chemicals. • COTP Standards of Care guidelines in the Harbor Safety Plan. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.
Subsequent Consequences		
Economic Impacts	<p>Today:</p> <ul style="list-style-type: none"> • Huge! 1 of 20 jobs in Southern California would be affected by port's closure. • Consequences of a port closure would extend to states beyond California. • One-week port closure would have international impact. • The major impact would be upon container cargos. • About 55% of ships could go through Cerritos Channel as an alternative. <p>Trends:</p> <ul style="list-style-type: none"> • Port working to expedite rail traffic out of the port. Will impact future Heim (Auto) and Ford (RR) replacement bridge projects. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> • There are two entrances to the port available to most ship traffic. • Financial liability requirements. • Port has high-power tugs and heavy lift cranes. San Diego Navy has ship salvage equipment about six hours away. • Other infrastructure is available to move cargo into the community. <p>New ideas:</p> <ul style="list-style-type: none"> • None discussed.

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FACTOR	RISKS	RISK MITIGATION STRATEGIES
Subsequent Consequences (continued)		
Environmental Impacts	<p>Today:</p> <ul style="list-style-type: none"> The entire port area is sensitive to environmental quality and vulnerability. Endangered species in the area include the California Brown Pelican, the California Least Tern, the Peregrine Falcon, the Marbled Murrelet and the Western Snowy Plover. There are sensitive wetlands at Seal Beach and Alamitos Bay. Beach closures would have a high impact on the tourism industry. Shallow water habitat at pier 400 and farther inside. Kelp beds are vulnerable. <p>Trends:</p> <ul style="list-style-type: none"> None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> Zones designated for quick-approval for use of dispersants, with expanded used being considered. Look to Volume of Petroleum risk factor for other comments. <p>New ideas:</p> <ul style="list-style-type: none"> See Volume of Petroleum.
Subsequent Consequences (continued)		
Health & Safety Impacts	<p>Today:</p> <ul style="list-style-type: none"> Potential for hazardous gas plume from discharges and fires to affect millions of people. <p>Trends:</p> <ul style="list-style-type: none"> None discussed. 	<p>Existing Mitigations:</p> <ul style="list-style-type: none"> The local counties have detailed and sophisticated plans for chemical response. <p>New ideas:</p> <ul style="list-style-type: none"> None.

Additional Risk Items:

- Natural disasters: Earthquakes and tsunami risks are high in their devastating effects.
- Electrical supply interruptions: ATON and the VTS/VTIS have backup power system.
- Aircraft collisions have caused the port to partially close.
- National security items: Sea Launch and military facilities pose risks as terrorist targets.
- Port facilities and visiting vessels are subject to disruptive eco-demonstration activity disrupting safe navigation.
- Economic terrorism.
- Seal Beach has LPG operations.

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- Union labor interruptions to port operations can alter navigation conditions as vessels await loading/offloading.
- Special marine events create additional safety and navigation concerns.
- Future landfills and development will impact waterway configuration and maybe current flows.
- High-speed ferries and hovercraft and other 100 MPH craft approaching port for permits to operate.
- Naval ship visits increasing with an attending increased port security impact.

Summary of Los Angeles/Long Beach Waterway Navigational Attributes

- ❖ **Ship Channel Complexity:** Narrow with moderate turns and bridges.
- ❖ **Converging or Crossing Traffic:**
 - San Pedro Bay: Queen & Angel's Gate (entering/departing vessel traffic), Southern/Western Traffic Lanes (entering/departing vessel traffic), Federal Anchorages (entering/departing vessel traffic).
 - Port of LA: Pier 300 & 400/Glenn Anderson channel, East & West Basin.
 - Port of LB: Back Channel/Cerritos Channel/Channel #2, Back Channel/Channel #3, Back Channel/East Basin, Long Beach Channel/Southeast Basin/Basin Six, Long Beach Channel/City of Long Beach.
- ❖ **Ship Channel Configuration:** Narrow to moderate.
- ❖ **Ship Channel Traffic:** Moderate to high, all types of waterway users.
- ❖ **Recreational and Local Fishing Activity:** Seasonally moderate to heavy. Over 250,000 pleasure craft are registered within a 100-mile radius of the port. Fridays to Mondays are the heaviest concentrations. About two regattas per weekend during off-season months, upwards of three to five regattas per weekend during summer months.
- ❖ **Bottom:** A mix of sand, mud, and rock.
- ❖ **Currents:** Negligible and usually in line with the channels, however can be critical at the harbor entrances and constricted areas of the ports for deep draft vessels during times of heavy rain/prolonged winds. Both ports experience a Seiche (a stationary vertical wave oscillation with a period varying from a few minutes to an hour or more) and Surge (external forces which cause a short period horizontal oscillation of the water.) Conditions are unpredictable and caused by changes to barometric pressure, strong winds or large swells outside the harbor entrances.
- ❖ **Wind:** 20% Light, 65% moderate, 13% strong, and 2% gale force winds. Winds are variable particularly in the fall and winter. Strongest during this period when the Santa "Ana" can blow. Winter storms are also responsible for strong winds greater than 17 knots. Gales are rare and occur occasionally during March through November. SW to W winds begin to prevail in spring and persist throughout the summer and into early fall. Winds are light and variable during the morning hours, when fog is more likely to occur, and pick up in the late morning and afternoon (10 to 15 knots) usually clearing the fog.
- ❖ **Visibility:** Concerns exist in the precautionary area located at the approaches as well as various areas inside both port complexes. There are about 105 days per year with

fog/visibility less than ½ mile. October to February averages 11 days per month with fog, and March to September averages 8 days per month with fog. Fog is prevalent night and morning hours when the wind is light and variable, and usually clears with the late morning and afternoon breezes.

Los Angeles/Long Beach Vessel Traffic Management Profile (Presently in Place)

❖ Aids to Navigation (USCG and Private)

- ✓ *Lighted & Unlighted* – Fixed & Floating: USCG and Private combination of all types of fixed and floating aids marking channels and dangers of lateral and regulatory significance.
- ✓ *Regulated Navigation Area (RNA)* – USCG: The approaches to the Ports of Los Angeles and Long Beach encompassing the Precautionary Area.
- ✓ *Physical Oceanographic Real Time System (PORTS)*: Installation is expected to be completed by April 2001 for all waterway users, allowing waterways management agencies to provide vital environmental data for the safe navigation, coordination and movement of vessels.

❖ Vessel Traffic Systems (VTIS/VTMS)

- ✓ Vessel traffic in the ports of and approaches to Los Angeles and Long Beach Harbors are monitored or managed by a Vessel Traffic System (VTS) comprised of three entities.
- ✓ San Pedro Traffic (VTS, monitor/inform/manage): Port approaches 25nm from Pt. Fermin to the Federal Breakwater.
- ✓ Jacobsen Pilot Service (VTIS, monitor/inform): Port of Long Beach.
- ✓ Los Angeles Harbor Pilots (VTIS, monitor/Inform): Port of Los Angeles.

❖ Situation Awareness (Each Ship)

- ✓ *Own Ship's & Other Ship's Position*: Situational awareness derived by communication between vessels, visual & radar observations made by vessel bridge navigation teams.
- ✓ *Other Ship's Intentions*: Radio communication with other vessels and information provided by the VTMS.
- ✓ *Waterway Configuration*: The Ports of Los Angeles-Long Beach are of a unique configuration with many narrow channels, turns, bridges, turning basins and bends that commercial vessels must navigate. Many areas allow very little room to maneuver. Management/Information authorities coordinate vessel traffic with consideration to destination and scheduled vessel traffic. Commercial vessels bound for berths within the port need to coordinate movements with other vessels for proper waterway utilization.

- ✓ *Environmental Conditions:* There are restrictions on vessel movements within the ports based on type of vessel, visibility, wind, vertical clearance and vessel draft considerations. Outlined procedures are monitored by the management/Information authority and coordinated between both management authority and applicable vessels.

Los Angeles/Long Beach Planned and Anticipated Changes

- ❖ *Planned Infrastructure Developments:* The Ports of Los Angeles and Long Beach are continually changing their infrastructure to meet the demands of foreign and domestic trade. Due to supply and demand the volumes of containerized cargo, oil, and bulk commodities continue to increase every year requiring these Infrastructure developments. Los Angeles and Long Beach remains the premiere West Coast ports for Far East, South American, South Pacific and Pacific Island trade.
 - ✓ Pier T and Pier S Landfill. (Port of Long Beach)
 - ✓ LA main channel deepening project. (Port of Los A)
 - ✓ Long Beach Cruise Ship Terminal (proposed, Port of Long Beach)
 - ✓ Old Todd Shipyard development. (Port of Los Angeles)
 - ✓ Pier 400 completion. (Port of LA)
- ❖ *Changes in levels and/or nature of waterway activities:* : Terminal will increase the opportunity for this industry to expand its market. Recreational boating traffic should remain the same. Passenger ferry traffic to Catalina Island remains constant. Local vessel traffic will remain constant with regards to tending vessels (ie. Water taxi's, Bunker barges, construction, ship and rig tending vessels, etc.). LA main channel deepening project will allow larger ships with more capacity to berth at container, tanker and bulk facilities. Volume of traffic will increase throughout both ports as infrastructure developments are completed. Ships are getting bigger, waterways are getting deeper and narrower. Supply and demand for overseas commodities are at an all time high and increasing each year.
- ❖ *Forecast Traffic Levels:* VTS Statistics for 2000 show 29,878 transits. This figure only includes vessels that transited outside the breakwater and does not capture commercial vessel movements that occurred solely within the breakwater. (ie. Inner harbor deep draft shifts, bunker barges, harbor cruises, etc.) . The transit statistics remain consistent the past two to three years. Advanced technologies in cargo handling, tracking and movement from the LA-LB area to other parts of the country keep this port complex the premiere location on the west coast. Approximately 5,800 deep draft vessel call on the ports of Los Angeles-Long Beach each year. The trend is for increased traffic as the ports expand particularly in intermodal containerized cargo. Commercial tankers, reefer and bulk traffic should remain consistent. Commercial container ships should continue to show a moderate increase. Planned infrastructure development is gearing towards increasingly containerized cargo handling. Commercial vessels calling for bunkers remains steady. Cruise ship traffic has generally increased each year in the Port of Los Angeles.

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- ❖ ***USCG Regulations to be implemented:*** AIS Implementation. The need to determine how AIS equipped vessels will participate in VTS/Waterways Management environment. Policies and procedures will need to be developed. Situational awareness and Traffic Management will be effected.

National VTS Regulations. Present State Regulations, local policies and procedures mirror National Regulations. Impact should be minimal.

Voluntary Speed Reduction (Private Industry, EPA). Private Industry is attempting to initiate voluntary speed reductions on commercial shipping in order to cut down on atmospheric emissions throughout the local area. This would reduce speeds of deep draft vessels to 12 knots, 20 miles from the port complex.